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B7L LAB L63X

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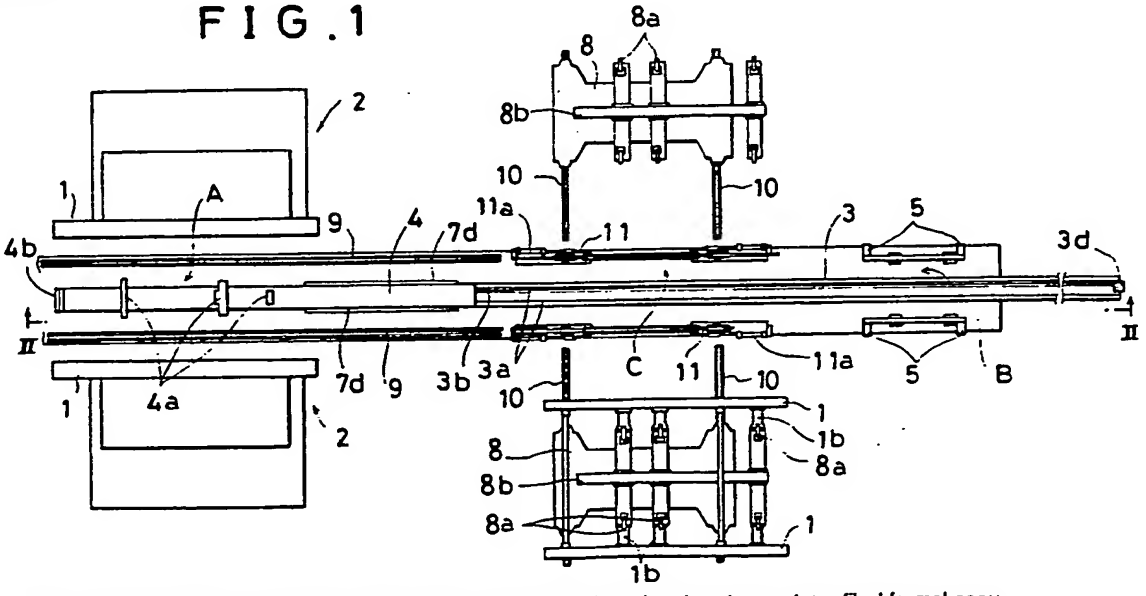
(54) Method for transporting vehicle bodies in a vehicle body welding line

(57) A vehicle body welding line comprises an assembly station A in which a vehicle body for an automobile may be assembled, a discharge station B located further down the line from the assembly station, transfer means 3,4 reciprocally movable between the assembly station and the discharge station so as to be capable of moving a vehicle body from the assembly station to the discharge station, and means for transporting a vehicle body from the discharge station to a succeeding additional welding line, wherein the assembly station and the discharge station are spaced from each other by a distance greater than the length of the vehicle to be welded, and a shunting station C is provided between the assembly and discharge stations whereby a vehicle body can be moved, on a replacing carriage 8 moving on rails 10, into a standby position off the main transfer line. Thus, should there be a stoppage in the assembly line beyond the discharge station B, the assembly operation at A can still be performed, on a short term basis, by moving already assembled bodies into a standby position.

FIG.1



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

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FIG.1

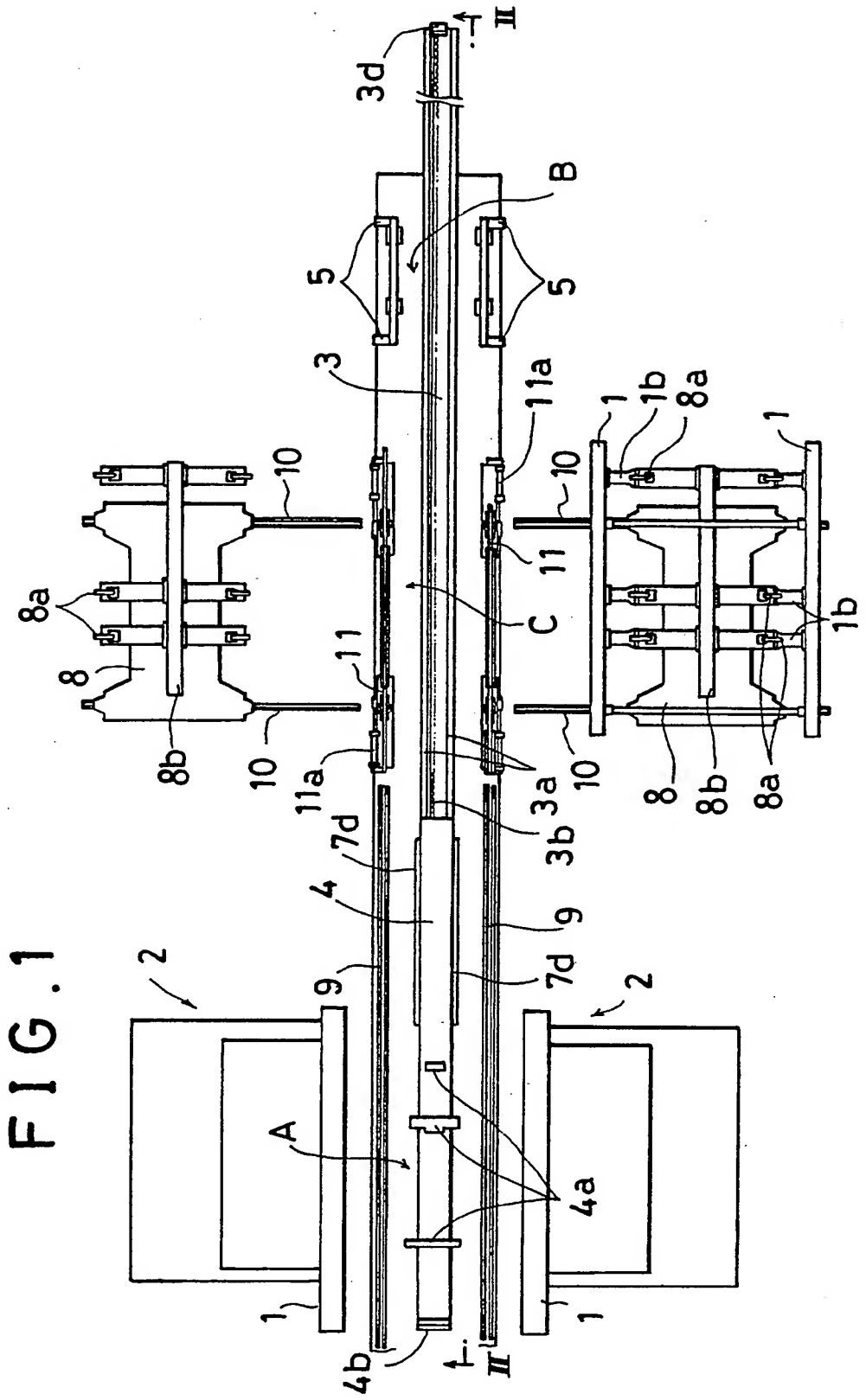


FIG. 2

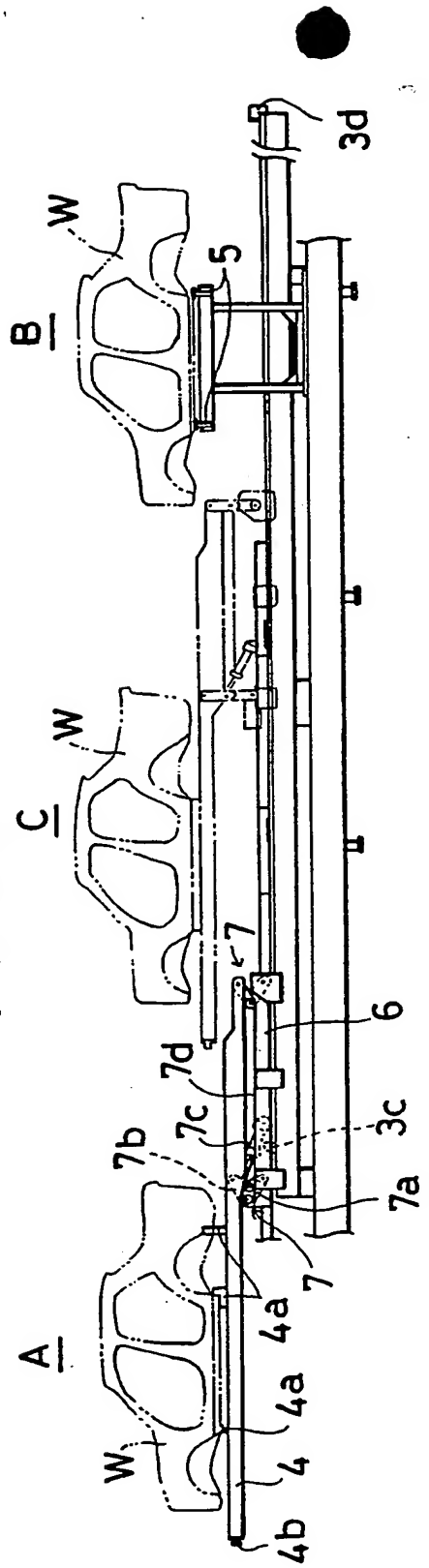


FIG. 6

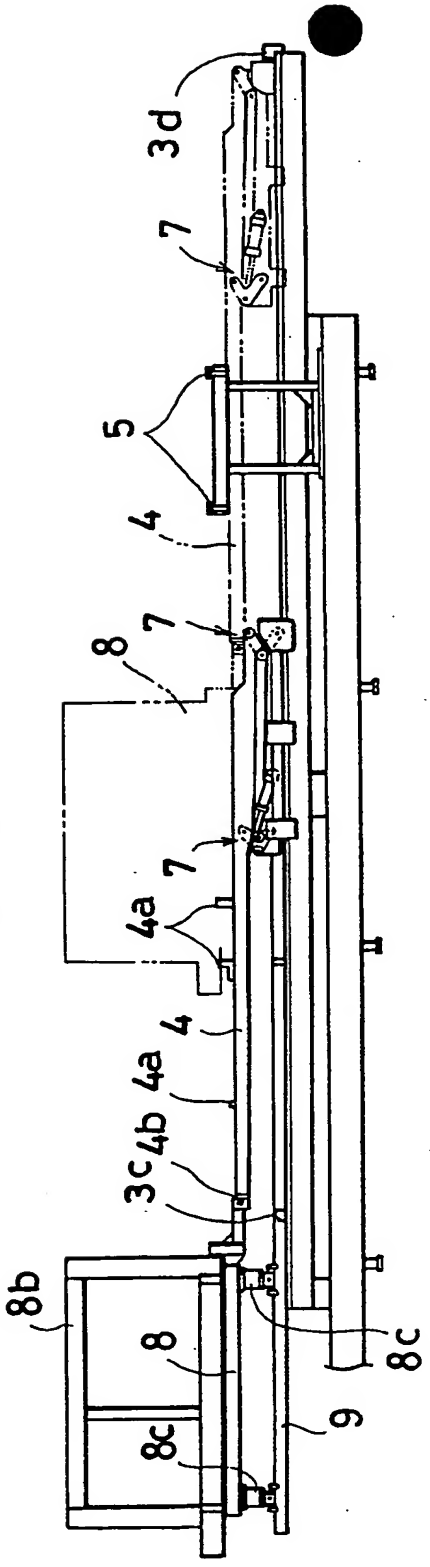


FIG. 4

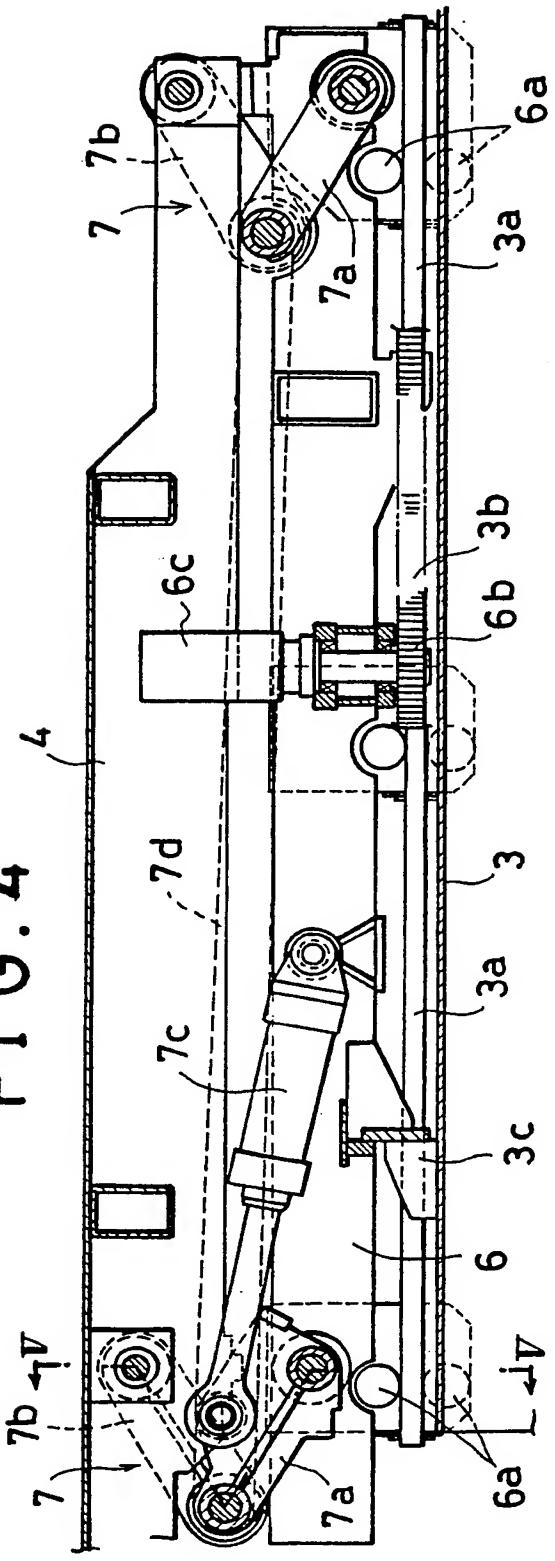


FIG. 7

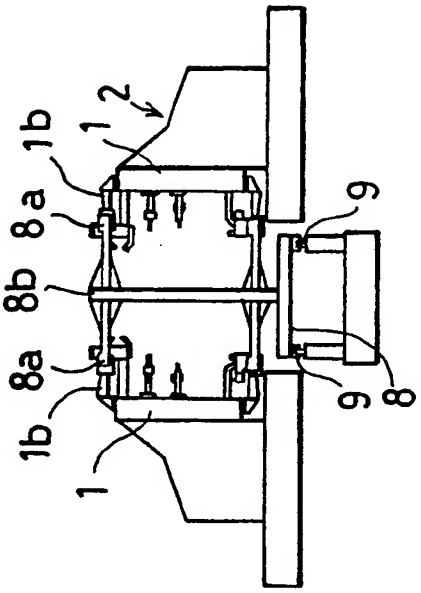
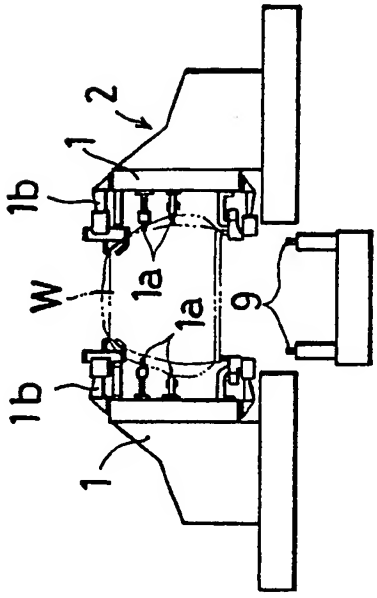


FIG. 3



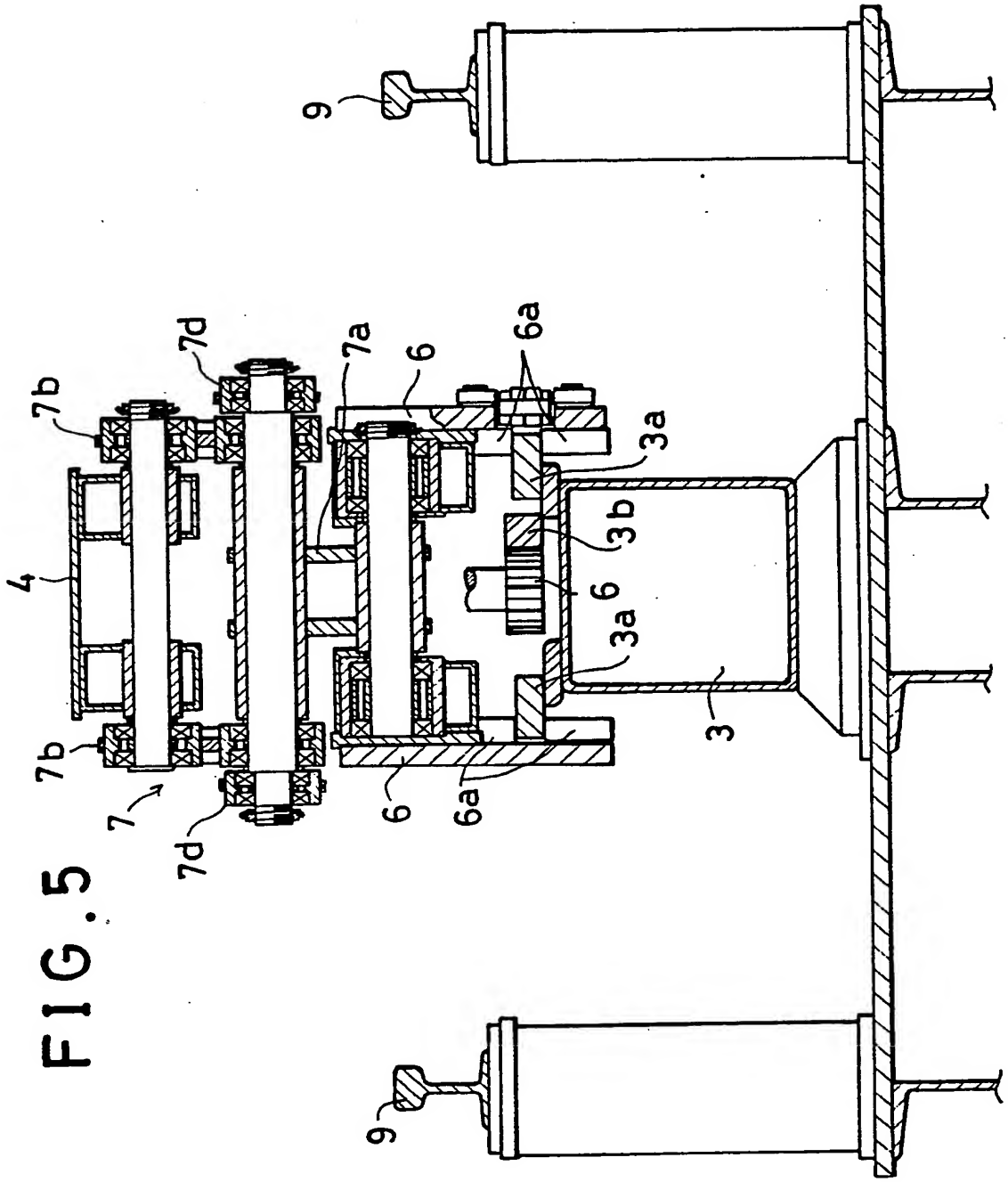


FIG.5

METHOD FOR TRANSPORTING VEHICLE BODIES IN A VEHICLE BODY WELDING LINE

The present invention relates to a method for transporting vehicle bodies in an automobile body welding line.

There are known conventional vehicle body welding lines in which a vehicle body is assembled by welding and attaching a floor, a roof and side panels which form a vehicle body of an automobile in a vehicle body assembly station (hereinafter referred to as the assembly station). The resulting vehicle body is then transported from the assembly station to a discharge station further down the line thereof by transfer means movable between both stations. The vehicle body is then transported from the discharge station to an additional welding line where additional welding of the vehicle body is performed.

A large number of welding robots having welding guns carried thereon are disposed in the additional welding line, a line-stoppage in the additional welding line for a short time may often occur due to problems such as the escape of pressurized air from a welding gun, or the like.

When line-stoppage in the additional welding line occurs in this manner, transportation of the vehicle body from the discharge station to the additional welding line is also stopped, with the result that it is not possible to transport vehicle bodies from the assembly station to the discharge station. Thus, the assembled vehicle body cannot be discharged and remains in the assembly station and hence, assembly of the next vehicle body cannot be performed in the assembly station, causing the entire vehicle body welding line to be stopped.

A vehicle body welding line is also known from

Japanese Unexamined Patent Application No. 63576/88, in which a shunting station for a replacing carriage which replaces used welding jigs by fresh welding jigs is provided between the assembly station and the discharge station, which are separated by a longer space than is usual so that the replacing carriage may be introduced to the assembly station from the shunting station to replace welding jigs of a welding machine disposed in the assembly station, and a vehicle body receiver is provided in the shunting station so that the vehicle bodies may be subsequentially transported from the assembly station to the discharge station through the shunting station. Even with the welding line described in this patent application, when line-stoppage in the additional welding line occurs, transportation of the vehicle body from both the discharge station and the shunting station is stopped and as a result, ejection of an assembled vehicle body from the assembly station cannot be performed, causing the entire vehicle body welding line to be stopped.

The present invention has been accomplished with the foregoing in view, and it is an object of the present invention to provide a new method for transporting vehicle bodies, wherein even if short term line-stoppage in the additional welding line occurs, the effect of that stoppage is not exerted on the assembly station, thereby increasing operating efficiency and improving productivity of the welding line.

According to the present invention, there is provided a vehicle body welding line, which comprises an assembly station in which a vehicle body for an automobile may be assembled, a discharge station located down the line from the assembly station, transfer means reciprocally movable between the assembly station and the discharge station so as to be

capable of transferring a vehicle body from the assembly station to the discharge station, and means for transporting the vehicle body from the discharge station to a succeeding additional welding line, wherein the assembly station and the discharge station are spaced apart from each other by a distance greater than the length of the vehicle to be welded, and the transfer means is also capable of transferring a vehicle body to an intermediate position between the assembly station and the discharge station.

With the above method, even if line-stoppage in the additional welding line occurs to cause the preventation of the transportation of a vehicle body from the discharge station, the vehicle body assembled in the assembly station may be discharged from the assembly station and transported to the intermediate position between the assembly and discharge stations by the transfer means and can be placed on standby, so that the assembly operation for the next vehicle body can be performed in the assembly station.

When the additional welding line has been restarted and the vehicle body has been transported from the discharge station, the vehicle body on standby in the intermediate position is transferred to the discharge station and thereafter, the transportation of the vehicle body from the assembly station to the discharge station is performed synchronously with the transportation of the vehicle body from the discharge station.

Line-stoppage in the additional welding line usually occurs for a short time and in many cases may be due to easily recoverable, simple problems. Stoppage of the entire line is not necessary up to the time when the assembly operation for the vehicle body next to that on standby in the intermediate position is completed in the assembly station, thus it is rarely

necessary for the whole of a vehicle body welding line according to the present invention to be stopped due to line-stoppage in the additional welding line.

For a better understanding of the present invention and to show how it may be put into effect reference will now be made to the accompanying drawings, in which:

Fig. 1 is a plan view of an assembly station and a discharge station in a welding line according to the present invention;

Fig. 2 is a sectional view taken along line II-II in Fig. 1;

Fig. 3 is an elevational view of the assembly station seen during assembly of a vehicle body;

Fig. 4 is an enlarged longitudinal sectional view of a portion of the transfer means;

Fig. 5 is a lateral cross-sectional view taken along line V-V in Fig. 4;

Fig. 6 is a sectional view of the welding line, similar to that of Fig. 2, seen during transportation of a substitute carriage; and

Fig. 7 is an elevational view of the assembly station seen during replacement of jigs.

Referring to Figs. 1 and 2, the reference character A designates an assembly station, and the character B denotes a discharge station located further down the line from the assembly station. Two automatic welding machines 2 are disposed on opposite sides of the assembly station A and each includes a welding jig 1, which has various welding guns 1a carried thereon for welding and attaching a floor, a roof and side panels, which are components for a vehicle body as shown in FIg. 3. A transfer bar 4 as transfer means is mounted on a central track 3 extending forwardly down the line from the assembly station A. Thus, a vehicle body W assembled by welding and attaching the floor,

the roof and the side panels in the assembly station A is transported to the discharge station B by the transfer bar 4 and placed onto a vehicle body receiver 5 disposed in the discharge station, and the vehicle body W is then transported from the discharge station to a succeeding additional welding line by transportation means such as a hanger.

As shown in Figs. 4 and 5, the transfer bar 4 is liftably supported on a movable frame 6 through two sets of front and rear link mechanisms 7, 7, each of which comprises a lower link 7a pivotally connected to the movable frame 6 and an upper link 7b pivotally connected to the transfer bar 4, so that it can be raised and lowered in a horizontal attitude in such a manner as to synchronously operate both link mechanisms 7, 7 by a cylinder 7c through a synchronous rod 7d. The movable frame 6 is movably supported on a pair of left and right guide rails 3a, 3a on the central track 3 through a plurality of sets of rollers 6a, which are longitudinally spaced from each other. A travelling motor 6c is carried on the movable frame 6 and has a pinion 6b provided on an output shaft and meshing with a rack 3b on the central track 3, so that the movable frame 6 and thus the transfer bar 4 can be longitudinally moved by the motor 6c. When the movable frame 6 has been moved to a retreated position in which it is restrained by a stop 3c mounted on a portion of the central track 3 close to the assembly station A, a rear end of the transfer bar 4 projecting rearwardly from the movable frame 6 is inserted into the lower side of the vehicle body W held between the welding jigs 1, 1 in the assembly station A, and the transfer bar 4 is raised to support the vehicle body W by a support member 4a mounted on an upper surface of the rear end of the transfer bar 4. Then, the movable frame 6 is advanced to an advanced position in which it

is restrained by another stop 3d on the central track 3, and the transfer bar 4 is then lowered, thereby transporting and placing the vehicle body W onto the vehicle body receiver 5 in the discharge station B.

It should be noted that when line-stoppage in the additional welding line occurs, the transportation of the vehicle body from the discharge station to the additional welding line is prevented, so that the vehicle body W which has been earlier transported to the discharge station B remains in the discharge station B, and the next vehicle body cannot be transported to the discharge station B.

Thereupon, in the present embodiment, the discharge station B is situated further down the line from the assembly station A by a space larger than one vehicle body, so that when the vehicle body W is incapable of being discharged from the discharge station B due to line-stoppage in the additional welding line, the transfer bar 4 is stopped in the course of its advance movement to the discharge station B, and the vehicle body W which has been assembled in the assembly station A is transported to and placed on standby in an intermediate position between the assembly station A and the discharging station B, as shown by a phantom line in Fig. 2. This enables the assembly operation for the next vehicle body to be performed in the assembly station A. When the additional welding line has been restarted and the transportation of the vehicle body from the discharge station B has occurred, the vehicle body on standby in the intermediate position is transported to the discharge station B.

In the Figures, the reference numeral 8 designates a replacing carriage for the welding jigs 1. Supporting frames 8b are carried on the replacing carriage 8 and have two sets of left and right grasping

members 8a mounted thereon in correspondence to the welding machines 2, 2 situated on the opposite sides of the assembly station A for grasping the welding jig 1 in docking members 1b mounted in a projecting manner on the welding jig as shown in Figs. 6 and 7. Therefore the welding jigs 1, 1 may be replaced between the welding machines 2, 2 when the replacing carriage 8 is transferred into the assembly station A.

The replacing carriage 8 is transported from a shunting station C provided between the assembly and discharge stations A and B to the assembly station A. More specifically, disposed on opposite sides of the central track 3 are travelling rails 9, 9 for replacing carriage 8, which extend from the shunting station C to the assembly station A, and a pair of replacing rails 10, 10 extending laterally on opposite sides of the shunting station C. Shunting rails 11 are provided at the intersection between the travelling rails 9 and the replacing rails 10. They are located at four corners of the shunting station C and are turnable by a cylinder 11a between a longitudinally directed position in which they are aligned with the traveling rail 9 and a laterally directed position in which they are aligned with the replacing rail 10. With the shunting rails 11 in their laterally directed positions, the replacing carriage 8 can be moved through the replacing rail into and out of the shunting station C, and with the shunting rails 11 in their longitudinally directed positions, the replacing carriage 8 can be moved reciprocally between the shunting station C and the assembly station A.

The replacing carriage 8 is provided, at four corners on its lower surface, with casters 8c each of which is turnable about a verticle axis to follow turning of a corresponding shunting rail 11. Further an engage portion 4b is mounted to the rear end of the

transfer bar 4 and can be brought sideways into and out of engagement with the front end of the replacing carriage 8. With the transfer bar 4 moved to the front end of the shunting station C, the front end of the replacing carriage 8 is brought into engagement with the engage portion 4b by introducing the replacing carriage 8 through the replacing rail 10 into the shunting station C, so that the replacing carriage 8 may be reciprocally moved between the shunting station C and the assembly station A by the transfer bar 4.

In replacing the jigs, the empty replacing carriage 8 on one side is first taken via the replacing rails 10 from the shunting station C to the assembly station A where the used welding jigs 1, 1 are shifted onto the replacing carriage 8, following which the replacing carriage is moved back to the shunting station C via the replacing rails 10. Then, the replacing carriage 8 on the other side, which is carrying the fresh welding jigs 1, 1 is taken via the replacing rails 10 to the assembly station A where the fresh welding jigs 1, 1 are shifted onto the welding machines 2, 2 following which the replacing carriage 8 is moved back to the shunting station C, thus completing the replacing operation.

As discussed above, according to the present invention, even if transportation of a vehicle body from the discharge station is prevented due to line-stoppage in the additional welding line, the assembly operation for the next vehicle body can be performed in the assembly station by transporting the vehicle body assembled in the assembly station to the intermediate position between the assembly and discharge stations and placing it on standby and thus, short term line stoppage occurring in the additional welding line does not affect the assembly station. This leads to an increase in operating efficiency of the entire line and

an improvement in productivity.

Claims

1. A vehicle body welding line, which comprises an assembly station in which a vehicle body for an automobile may be assembled, a discharge station located further down the line from the assembly station, transfer means reciprocally movable between the assembly station and the discharge station so as to be capable of moving a vehicle body from the assembly station to the discharge station, and means for transporting a vehicle body from the discharge station to a succeeding additional welding line, wherein the assembly station and the discharge station are spaced from each other by a distance greater than the length of the vehicle to be welded, and the transfer means is also capable of transferring a vehicle body to an intermediate position between the assembly station and the discharge station.

2. A vehicle body welding line according to claim 1, wherein the transfer means is mounted on a track extending from the assembly station to the discharge station.

3. A vehicle body welding line according to claim 1 or 2, wherein the transfer means is in the form of a transfer bar liftably mounted on a movable frame.

4. A vehicle body welding line according to claim 3, wherein the transfer bar is mounted movably on the movable frame by means of at least one link mechanism comprising a first link pivotally connected to the movable frame and a second link pivotally connected to the transfer bar, so that the transfer bar may be raised and lowered with respect to the movable frame.

5. A method for transporting a vehicle body in a vehicle body welding line, which comprises:

(a) transporting a vehicle body from an assembly station, in which the body may be assembled, to a

discharge station located further down the line from the assembly station by transfer means reciprocally movable between the assembly station and the discharge station which are spaced from each other by a distance greater than the length of the vehicle to be welded;

(b) transporting the vehicle body from the discharge station to a succeeding additional welding line; and

(c) when step (b) above may not be carried out due to a line-stoppage in the additional welding line, transporting the vehicle body from the assembly station to an intermediate position between the assembly station and the discharge station, and when the additional welding line has been restarted and the vehicle body has been transported from the discharge station to the additional welding line, transporting the vehicle body from the intermediate position to the discharge station.

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